

Claims

1. A process for producing a transgenic sugar beet plant, which comprises:
 - a) transforming at least one sugar beet cell with at least two transgenes, with the first transgene encoding a vacuolar pyrophosphatase (V-PPase) and the second transgene encoding a cytosolic and/or nucleus-located soluble pyrophosphatase (C-PPase),
 - b) culturing and regenerating the transformed cells under conditions which lead to the complete regeneration of the transgenic beet plant, and
 - c) obtaining a transgenic beet plant having an increased sucrose content in the beet, an increased and/or extended meristem activity and/or a reduced rate of sucrose breakdown during storage.
2. The process as claimed in claim 1, wherein the first transgene comprises a nucleic acid sequence which is selected from the group of the nucleotide sequences consisting of
 - a) a nucleotide sequence depicted in SEQ ID No. 4, a sequence which is complementary thereto,
 - b) a nucleotide sequence encoding the amino acid sequence depicted in SEQ ID No. 5, a sequence which is complementary thereto, and
 - c) a nucleotide sequence which exhibits a sequence identity of more than 80% with the sequence according to a) or b).

3. The process as claimed in claim 1 or 2, wherein the second transgene comprises a nucleic acid sequence which is selected from the group of the nucleotide sequences consisting of

- a) a nucleotide sequence depicted in SEQ ID No. 1, a sequence which is complementary thereto,
- b) a nucleotide sequence encoding the amino acid sequence depicted in SEQ ID No. 2, a sequence which is complementary thereto, and
- c) a nucleotide sequence which exhibits a sequence identity of more than 80% with the sequence according to a) or b).

4. The process as claimed in one of the preceding claims, wherein the first and/or second transgene is arranged on a vector.

5. The process as claimed in one of the preceding claims, wherein the vector is equipped for overexpressing the first and/or second transgene.

6. The process as claimed in one of the preceding claims, wherein the first and/or second transgene is/are operatively linked, on the vector, to a promoter.

7. The process as claimed in one of the preceding claims, wherein the promoter is a tissue-specific promoter, a constitutive promoter, an inducible promoter or a combination thereof.

8. The process as claimed in one of the preceding claims, wherein the promoter is a promoter from *Beta vulgaris*, *Arabidopsis thaliana* or the cauliflower mosaic virus.

9. The process as claimed in one of the preceding claims, wherein the promoter is the CaMV35S promoter.

10. The process as claimed in one of the preceding claims, wherein the promoter is a *Beta vulgaris* V-PPase promoter.

11. The process as claimed in the preceding claim, wherein the promoter comprises a nucleotide sequence which is selected from the group of nucleotide sequences consisting of

- a) a nucleotide sequence as depicted in SEQ ID No. 6 or 7, a sequence which is complementary thereto, and
- b) a nucleotide sequence which exhibits a sequence identity of more than 80% with one of the sequences as depicted in SEQ ID No. 6 or 7.

12. The process as claimed in one of the preceding claims, wherein the promoter is the sucrose synthase promoter.

13. The process as claimed in one of the preceding claims, wherein the promoter is a storage-specific promoter.

14. The process as claimed in one of the preceding claims, wherein the vector possesses introns enhancers or other regulatory elements.

15. The process as claimed in one of the preceding claims, wherein the first and second transgenes are arranged together on a single vector.

16. The process as claimed in one of the preceding claims, wherein the first and second transgenes are arranged on different vectors.

17. The process as claimed in one of the preceding claims, wherein the first and second transgenes are transformed simultaneously.

18. The process as claimed in one of the preceding claims, wherein the transformation is a biolistic transformation, an electrotransformation, an agrobacterium-mediated transformation and/or a virus-mediated transformation.

19. A transgenic, preferably fertile, plant containing at least one transformed cell which can be obtained using a process as claimed in one of the preceding claims.

20. The transgenic plant as claimed in the preceding claim, which exhibits an increased content of sucrose.

21. The transgenic plant as claimed in one of the preceding claims, which exhibits an increase in meristem activity during growth.

22. The transgenic plant as claimed in one of the preceding claims, which exhibits a decreased rate of sucrose breakdown during storage.

23. A harvesting or propagation material from a transgenic plant as claimed in one of the preceding claims.

24. A nucleic acid molecule encoding a protein having the biological activity of a *Beta vulgaris* soluble pyrophosphatase, in particular a C-PPase, with the sequence of the nucleic acid molecule being selected from the group of the nucleotide sequences consisting of:

- a) a nucleotide sequence depicted in SEQ ID No. 1, a sequence which is complementary thereto,
- b) a nucleotide sequence encoding the amino acid sequence depicted in SEQ ID No. 2, a sequence which is complementary thereto, and
- c) a nucleotide sequence which exhibits a sequence identity of more than 80% with the sequence according to a) or b).

25. A nucleic acid molecule encoding a promoter of a *Beta vulgaris* vacuolar pyrophosphatase (V-PPase), with the sequence of the nucleic acid molecule being selected from the group consisting of

- a) a nucleotide sequence as depicted in SEQ ID No. 6 or 7, a sequence which is complementary thereto, and
- b) a nucleotide sequence which exhibits a sequence identity of more than 80% with one of the sequences as depicted in SEQ ID No. 6 or 7.

26. The use of the nucleic acid molecule as claimed in claim 24 for producing a transgenic plant which contains at

least one transformed cell.

27. A vector which contains the sequence of the nucleic acid molecule as claimed in claim 24 and/or 25.

28. The vector as claimed in claim 27, which is a viral vector or a plasmid.

29. The use of the vector as claimed in claim 27 or 28 for producing a transgenic plant which contains at least one transformed cell.

30. A host cell which is transformed with a vector as claimed in claim 27 or 28.

31. The host cell as claimed in claim 30, which is a bacterial cell, plant cell or animal cell.